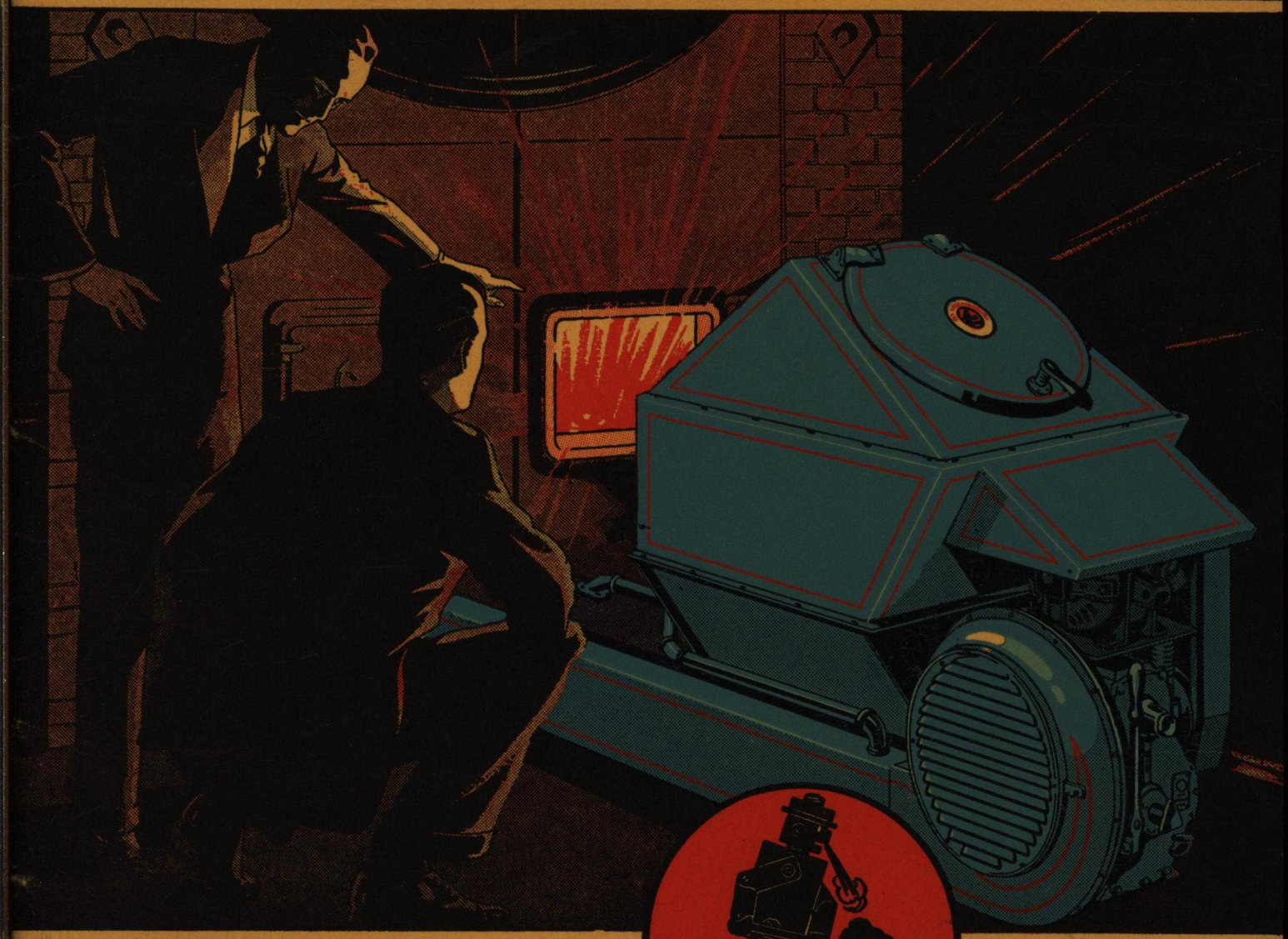
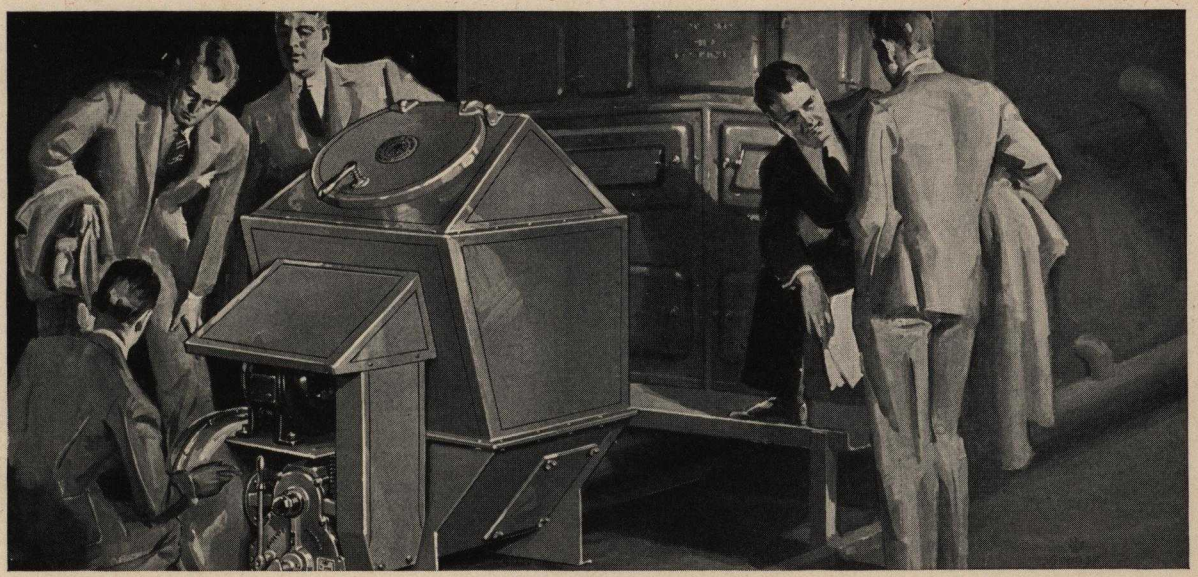
# The IRON FIREMAN



THE IRON FIREMAN
forced UNDERFIRING

CATALOG 31

## THE MACHINE THAT MADE COAL AN AUTOMATIC FUEL



# *"I'd rather take the carburetor off my car than do without the* Iron Fireman"

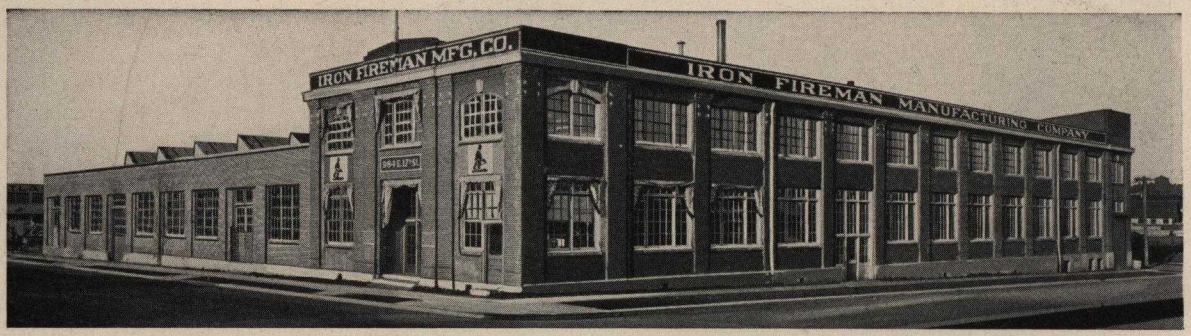
QUICK TO RECOGNIZE true economy and advanced standards of comfort, American business men have definitely approved and endorsed the Iron Fireman.

The evidence is overwhelming. Thousands of Iron Fireman Automatic Coal Burners already are in use throughout America. Every day sees an increase in the number of installations. Letters giving definite statements of fuel and labor savings and other Iron Fireman benefits are constantly being received from enthusiastic owners. Many hundreds of such letters and comparative cost statements are on file.

Based on irrefutable records, carefully kept, the Iron Fireman shows savings of 15 to 50 per cent and more, in fuel costs alone over hand firing. In addition, it gives greatly increased standards of comfort and convenience because it automatically maintains a steady, even room temperature or boiler pressure. The Iron Fireman eliminates smoke and complies with smoke ordinances. A building heated by the Iron Fireman is a pleasant place in which to live and to work.

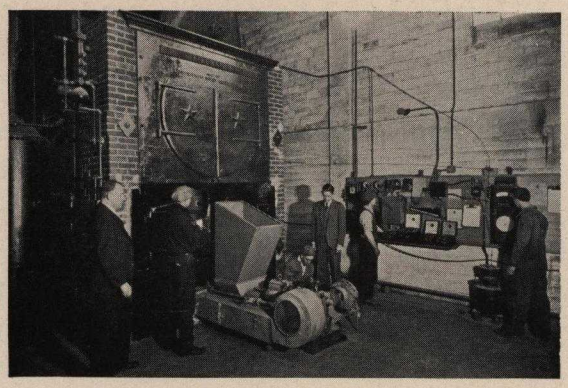
The Iron Fireman is to a boiler or furnace what a carburetor is to a motor. It steadily feeds coal into the fire just as needed to maintain the heat or steam pressure required, at the same time supplying air in the exact proportion needed for complete combustion.

# The Company which makes the Iron Fireman

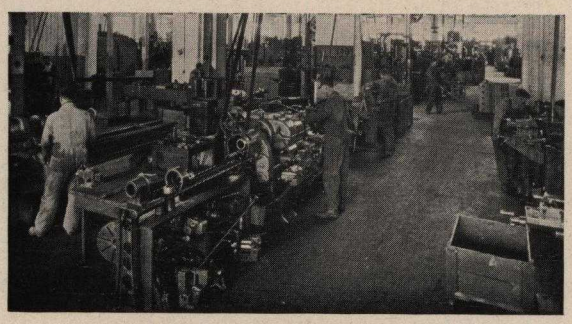



THE IRON FIREMAN PLANT *at Portland, Oregon*

DRAFTING ROOM—ENGINEERING DEPARTMENT



ONE OF THE BOILERS USED FOR TEST PURPOSES



A SECTION OF THE MACHINE TOOL DEPARTMENT

IN AUTHORIZING an expenditure or in making a purchase, the finest thing an executive can know is that he has obtained the greatest possible value, all things considered.

Unfortunately the executive does not always have time to make a technical study of the mechanical appliances he buys, nor even to check up carefully upon the accuracy or relative importance of the various features claimed as advantages.

Today, if business men had to select every mechanical appliance strictly on their own judgment as to mechanical merits, each purchase would require so much study and investigation as to impose a serious burden on the purchaser.

We have therefore become accustomed to accepting products upon their face value just as we do people. And, as in placing confidence in people we want to know who and what they are, so in buying a product we want to know about the company that makes it and the concerns who use it.

Because today, we must buy many things on confidence, the institution back of the article we buy often means quite as much in influencing our decision as does our own judgment of the article itself.

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It is not hard to realize the savings and conveniences which Iron Fireman brings. Iron Fireman engineers reduce these savings and advantages to a definite, concrete proposition which may be weighed against cost. You can figure what the Iron Fireman will earn for you on your investment just as you can figure what any other proved investment can earn.

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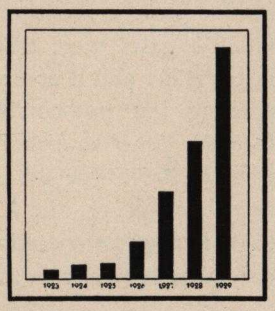
It is easy to understand the basic scientific principle of combustion which Iron Fireman developed and named *forced underfiring*, and to understand *why* this method of firing can achieve such outstanding economies and betterments. It is easy to see why coal fed to the fire in this manner makes

THE CHICAGO OFFICE AND SALESROOM are on the street floor of this building, *572 West Randolph Street*

a hotter fire, gets *all* the heat from coal, prevents smoke, saves labor costs. It is easy to appreciate the benefits of steady, even temperature or pressure. The savings through the use of lower priced coal are also quite apparent.

But the dependability of the machine which brings all these advantages rests largely upon the kind of company which makes and sells it. The unfailing day-in and day-out service of the machine must necessarily depend upon the integrity and ability of the manufacturer who makes it and the service organization which is ever available to insure satisfactory performance.

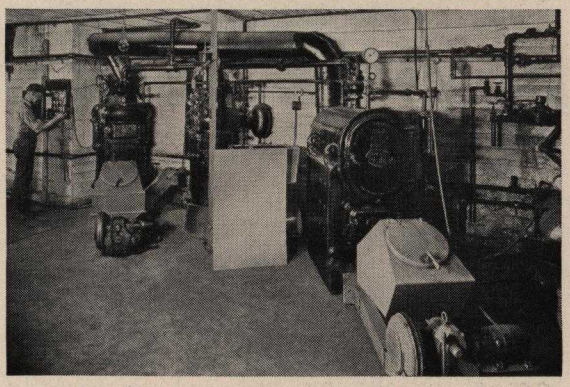
When you buy an Iron Fireman Automatic Coal Burner, you are glad to know that it is backed by a large company of known financial standing, with a continuous record of successful operation and steady growth—the pioneer in its field. You are glad to know that it is a thoroughly standardized machine made to precision standards on a volume basis so large as to exceed the combined total production of all other machines in the same field; that it is manufactured in a plant which is the equal in equipment and workmanship skill of any machine-producing plant in America. You are glad to know that continuous laboratory research is conducted to improve the machine, keeping it constantly in the lead.



Iron Fireman sales growth, as shown above, is evidence of the successful performance of the Iron Fireman Automatic Coal Burner

Iron Fireman engineers have pioneered the field of automatic coal burning. Many of the important scientific discoveries and mechanical developments in the field of automatic coal burners have originated in the Iron Fireman engineering organization, with the support and cooperation of its field men, dealers, district engineers and service men. New ideas and methods are constantly being developed and tested. Those which pass the rigid tests, and prove their worth over a sufficient period of time under actual operating conditions, are adopted and passed along to Iron Fireman users through the nation-wide Iron Fireman organization. And last, but not least, there is satisfaction in knowing that you are purchasing a machine which is so distinctly the leader that it has been adopted by more users than all other machines in the same field combined.

THE ST. LOUIS BRANCH AND WAREHOUSE are located in this building, *2723 Olive Street*

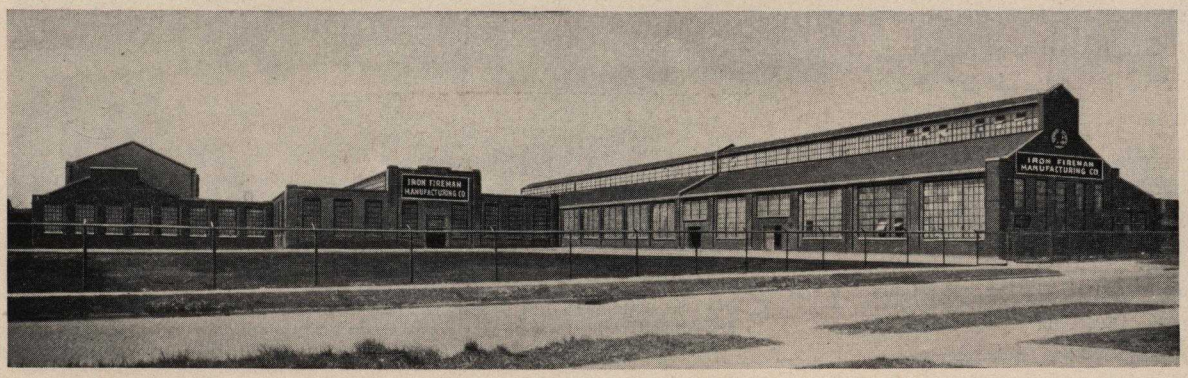


A CORNER IN THE TESTING LABORATORY

The Iron Fireman is a profitable investment because it makes money for its users.

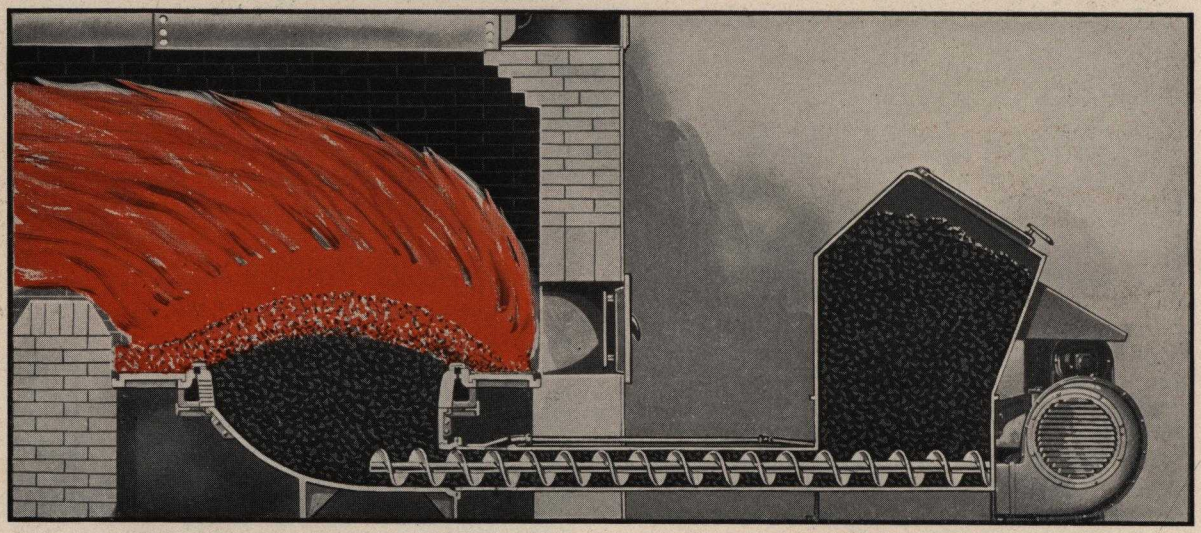
It is a safe investment because there are so many thousands making good in actual use throughout America that the purchaser knows what it will do.

The Iron Fireman is a conservative investment because the company which makes it is strong and conservative.




THE IRON FIREMAN PLANT *at Cleveland, Ohio*

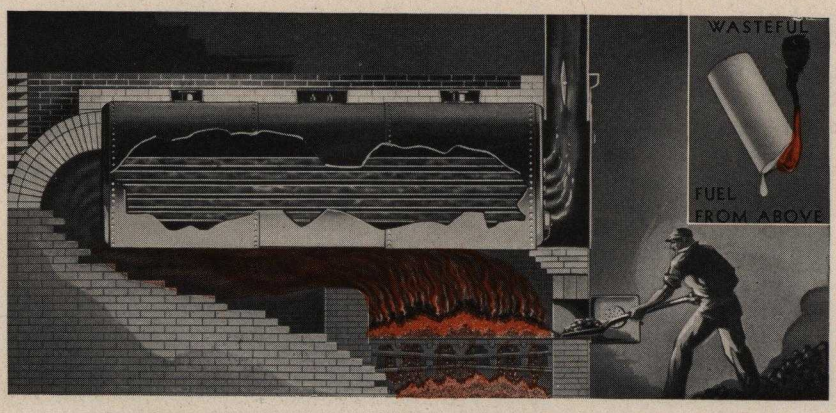
# The principle of *non-agitated*



It is a well known scientific fact that to produce the ideal coal fire, the fuel should be fed *from underneath* in a continuous stream. The volatile gases in the green coal should be distilled off at as low a temperature as possible, in the presence of an excess of oxygen. These gases on their way to the smoke stack should pass through an unbroken layer of incandescent fuel, and consequently the fuel bed should not be agitated or disturbed.

The Iron Fireman system of feeding and burning coal complies with each of these fundamental requirements. *Non-agitated forced underfiring*, the scientific principle employed by Iron Fireman, is easily understood, and explains how and why Iron Fireman achieves such remarkable savings and betterments.

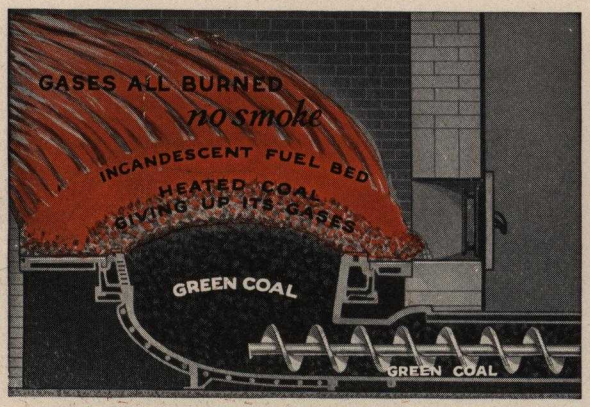
Green coal is slowly conveyed by a revolving worm from the hopper to the retort, which is directly beneath the incandescent fuel bed. The retort turns the flow of fuel upward, and as the coal approaches the fire, it is gradually heated. The volatile gases are distilled off, and as they pass upward through the incandescent fuel bed, are ignited, consumed, and turned into useful heat. Meanwhile the solid residue (now in the form of coke), from which the volatile gases were distilled, is forced upward into the fire and is completely consumed, leaving nothing but non-combustible ash. Since Iron Fireman *forced underfiring* produces firebox temperature from 500 to 1000 degrees hotter than does hand firing, the loose ash from nearly all coals is fused into easily removed clinkers, with only about 25 per cent of the bulk of loose ashes.



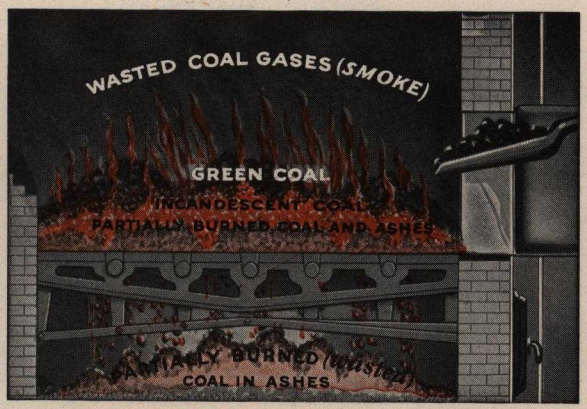

HAND-FIRING—HIGH BRIDGE WALL, STACK DAMPER OPEN—SMOKY, WASTEFUL FIRE

In hand-firing, green coal is thrown on top of a hot bed of burning coal. Rarely is it evenly distributed. Quantities of dense smoke, composed of volatiles with high heating value, are distilled off and go up the stack as waste, fouling flues with soot as they go. Unburned and half coked lumps of coal sift through the grates and fall into the ash pit to be shoveled out, representing additional wasted heat value. Fire doors have to be opened constantly, with resulting inrushes of cold air, cooling the boiler and causing back drafts. The hand stoked fire burns at a comparatively low temperature, 1700 to 2000 degrees Fahrenheit, producing quantities of loose ashes. No hand-fired boiler works at top efficiency.

# "forced underfiring" explained




OBSERVE WHAT HAPPENS in the process of "*forced underfiring.*" The feed worm forces coal upward, under the fire. Coal is slowly preheated, the gases thus released passing upward through the fire, where they are burned. Coked coal is burned when it reaches the incandescent fuel bed. No smoke nuisance. No fuel waste.




YOU SEE HERE why hand-firing is so wasteful. Green coal is thrown on top of hot fuel bed. Valuable gases are released immediately, and pass up the stack unburned. Air supply is deficient. Unburned coal drops through into ash pit.

Contrast Iron Fireman *forced underfiring* with hand firing. In *hand firing*, green coal is shoveled *on top of the fire*, blanketing the incandescent fuel bed and cooling the fire. As the coal is heated, its volatile gases are distilled off *above* the incandescent fuel bed in the absence of sufficient air. This precipitates black smoke, due to the heavy carbon content of the unburned gases.

Black smoke, thus formed, contains valuable heat units, which with this method of firing go up the stack wasted.

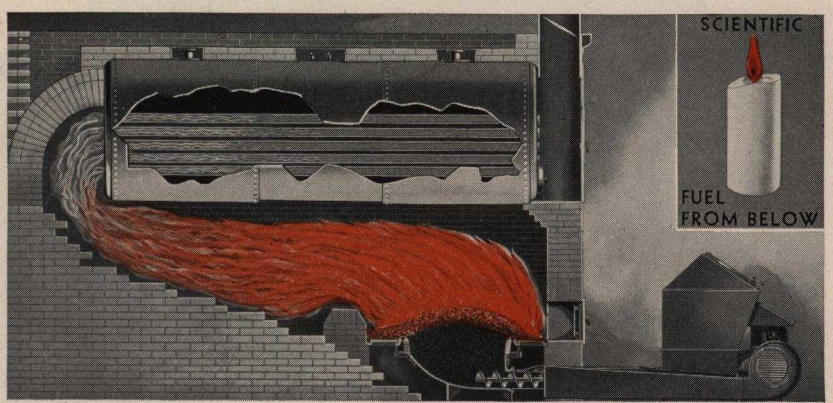
Furthermore, the constant opening of the fire doors allows frequent inrushes of cold air, which does not aid combustion, but which chills and cuts down the efficiency of the furnace.

The Iron Fireman is especially designed to burn the smaller sizes of coal, which cost less per ton than larger sizes of the same quality. In addition to this saving, the Iron Fireman extracts more heat per ton from the smaller coal.

The operation of the Iron Fireman is governed by thermostatic or pressure controls, which start and stop the Iron Fireman automatically, and hold the boiler pressure, or water or room temperature, at any desired point.

When the fundamental difference between Iron Fireman *forced underfiring* and old-fashioned hand firing is considered, it is easy to understand why the Iron Fireman can pay for itself so quickly, and can bring results in the form of greater economies and uniform, dependable heat and power that were never before thought possible.

An authorized Iron Fireman representative will gladly make a survey of your plant and render you a complete report of his findings. This service is gratis and accepting it will in no way obligate you.

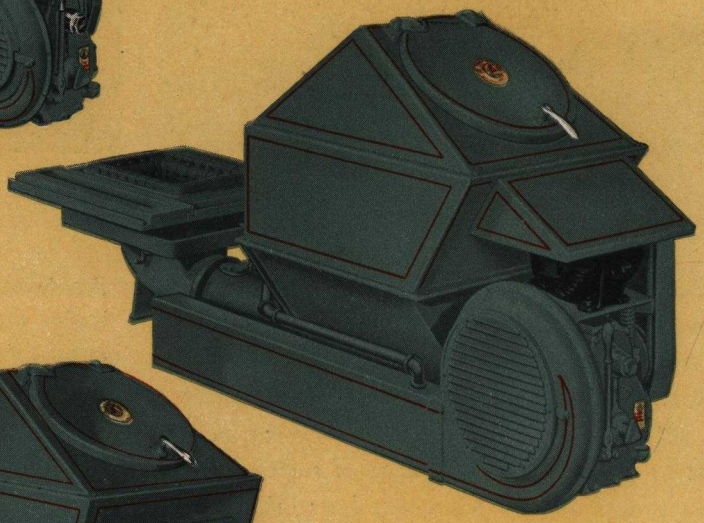



IRON FIREMAN—LOW BRIDGE WALL, STACK DAMPER PARTIALLY CLOSED—HOT "BLAST FURNACE" FIRE

The Iron Fireman slowly preheats the coal, bringing it up to the flash point as it nears the top of the fire bed. Volatile gases, which ordinarily go up in smoke, are liberated in the retort and are completely consumed. The controlled forced draft generates an intense heat, averaging 2400 to 2800 degrees, F. This consumes everything combustible in the coal, the ash being fused into clinkers which are easily lifted out. An Iron Fireman fired furnace is never choked with coal, nor is the fire allowed to die down. Automatic controls insure the exact fuel supply necessary to produce any desired degree of heat or boiler pressure.

# The Iron Fireman is made in a complete
# power plants, and for ho

De Luxe for Homes



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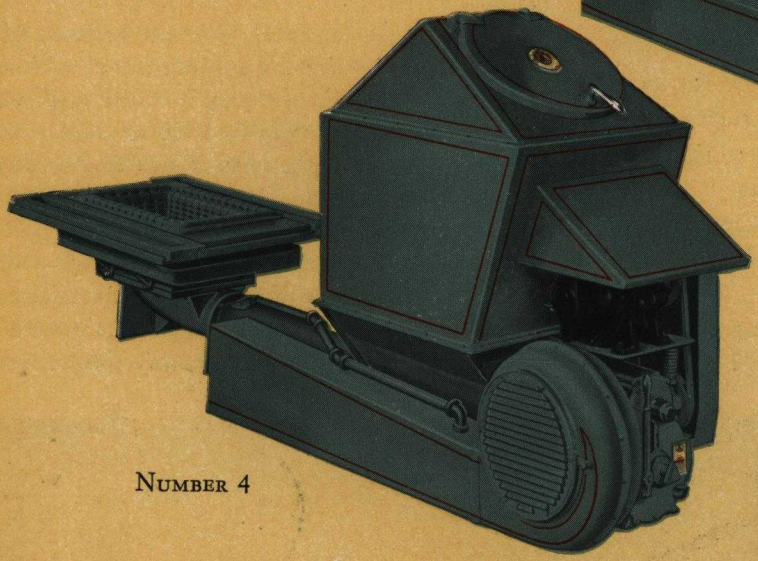

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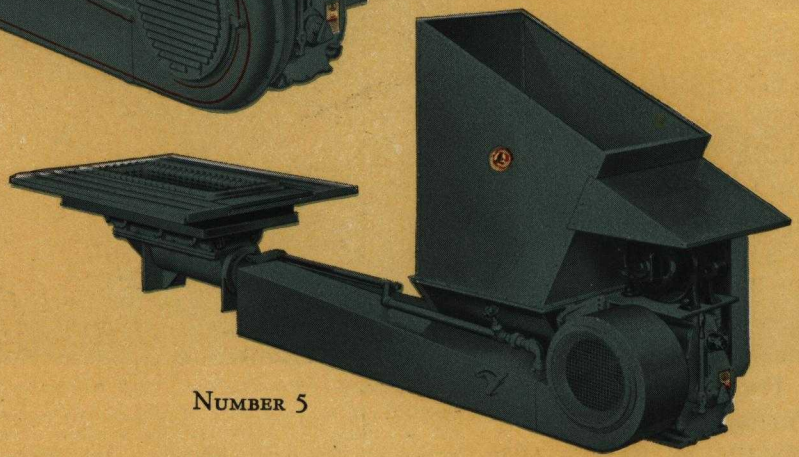
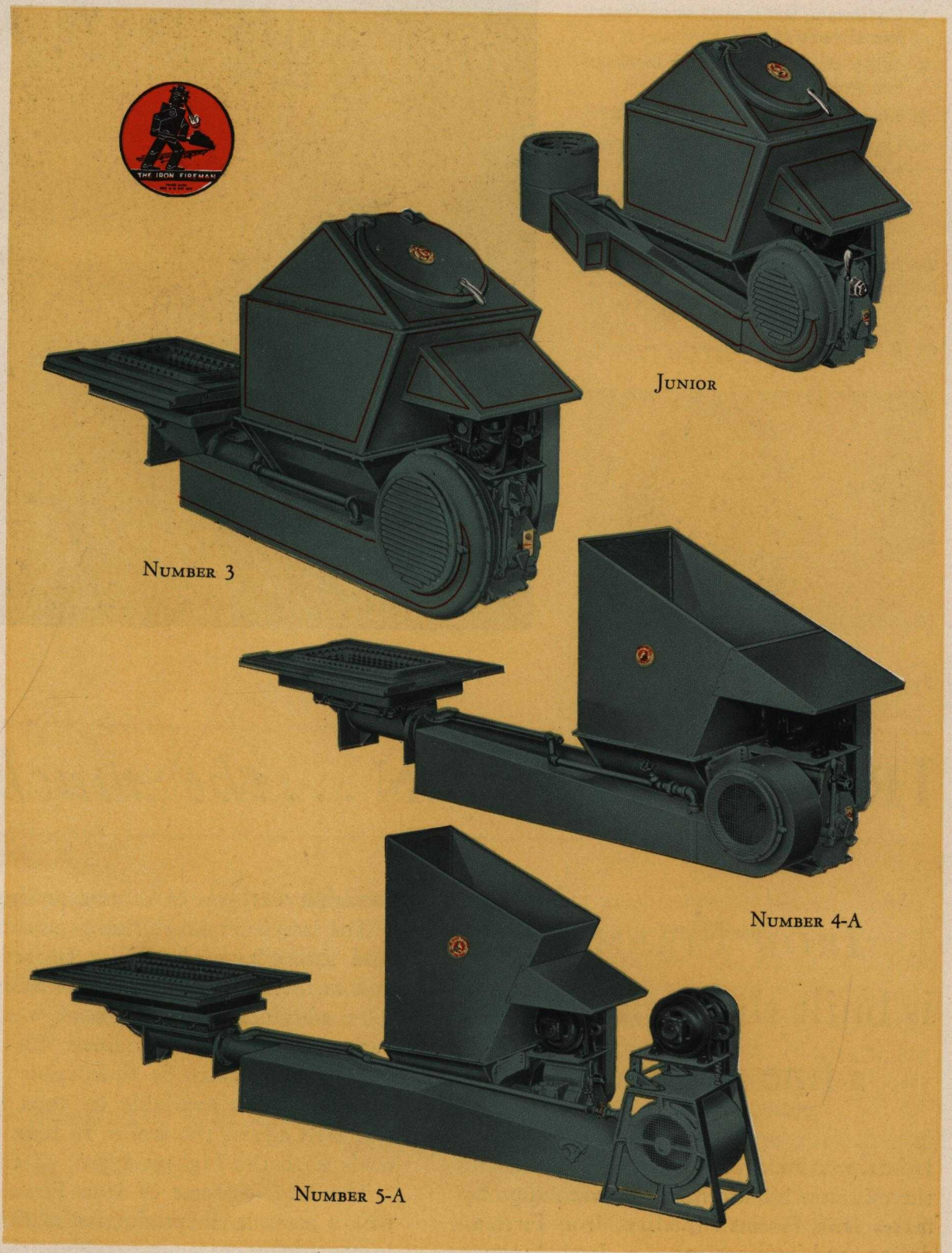


Number 5

# range of sizes for commercial heating and me boilers and furnaces




JUNIOR

NUMBER 3

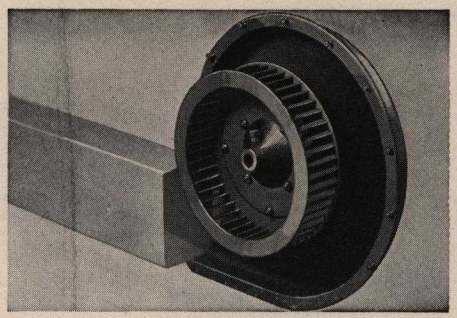
NUMBER 4-A

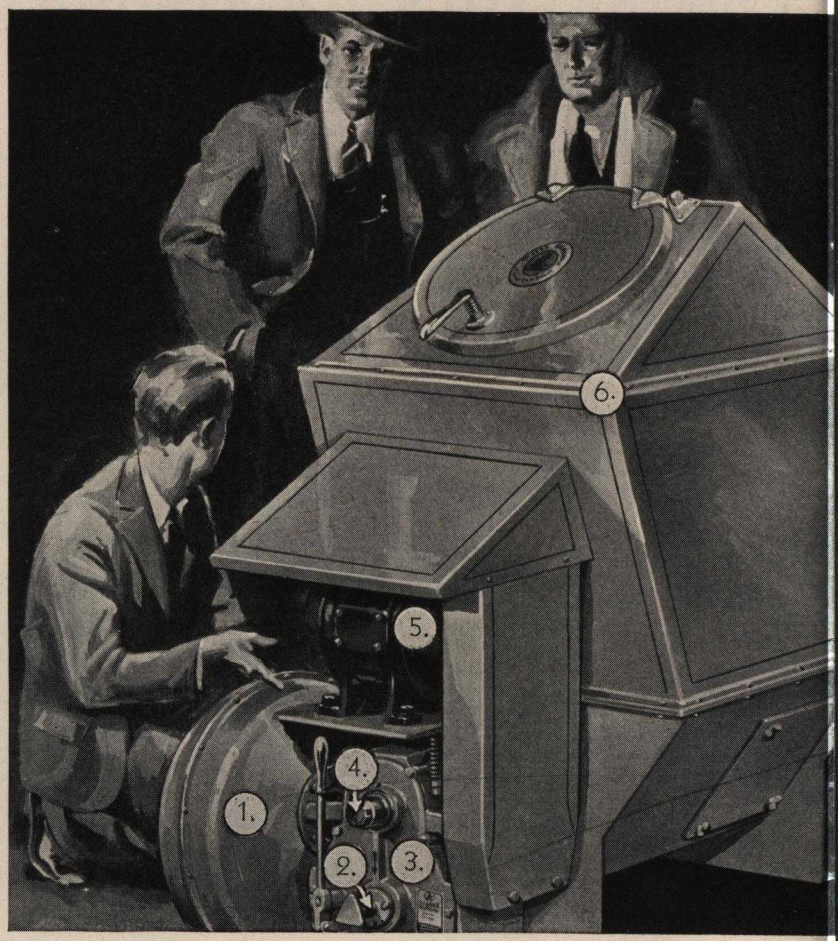
NUMBER 5-A

1. Quiet ball bearing fan supplying forced draft to fire.
2. Gear shift for transmission. Three speeds and neutral.
3. Continuous feed transmission. Gears run in bath of oil.
4. Safety shear pin—protects mechanism from damage.
5. Electric motor—standard make.
6. Coal hopper—heavy copper bearing sheet steel.

### The Iron Fireman Fan

The Iron Fireman centrifugal fan is accurately balanced to eliminate vibration and is quiet in operation. Air volume is easily regulated by an iris shutter at the inlet, thus providing exactly the right amount of air for complete combustion.






# IRON FIREMAN... *the machine*

## IRON FIREMAN is built throughout like a fine automobile

IN ALL THE FIELD of coal burning appliances, there is no other machine that even approximates Iron Fireman quality, Iron Fireman design and engineering, or Iron Fireman precision methods of volume production.

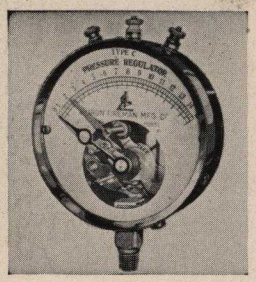
The Iron Fireman automatic coal burner is sold throughout the entire United States and in foreign countries. It is designed to burn efficiently types of coal suitable for automatic firing. The engineer who installs your Iron Fireman is thoroughly familiar with the coals available in your locality, and will adjust the stoker to burn suitable coals with the highest degree of efficiency.

The large volume of Iron Fireman sales makes possible the production of this superior machine at costs comparable with cheaply


7. Dead plates made of heavy iron and ribbed.
8. Sectional tuyere blocks of iron through which air is supplied to the fire.
9. Auxiliary air duct. Insures positive movement of all gases through the fire.
10. Steel housing enclosing feed worm.
11. Wind box. Equalizes air supply—cools retort tuyeres and dead plates.

### Automatic Controls

Automatic controls start and stop the Iron Fireman. They are made for every type of plant—proper units are supplied with each installation. Two types of pressure regulators are standard; one for steam boilers of any pressure and one for low pressure and vacuum systems. A hot water control is used for hot water boilers. The clock or plain thermostat controls the temperature of residence or building. The furnace control provides for desired maximum temperature of firebox. The various Iron Fireman automatic controls are shown in detail on pages 12 and 13.



# *that made coal an automatic fuel*

constructed stokers. But on a *basis of value delivered*, in the quality of the machine itself, in its long life; in the responsibility and service of the company back of it, and in the results it delivers, Iron Fireman is preeminent.

## *Installation is Quick and Simple*

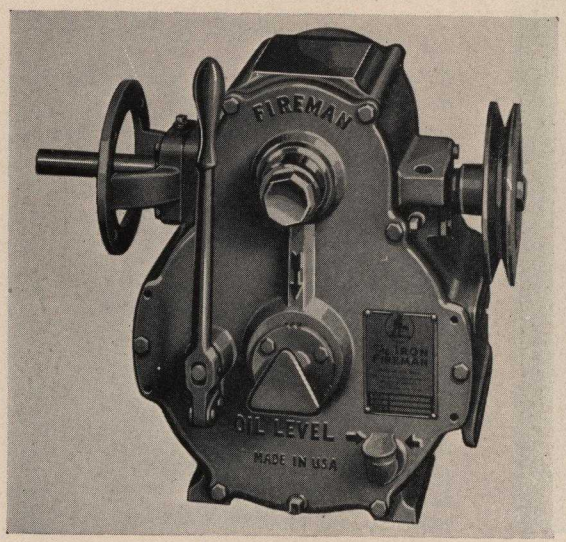
The Iron Fireman can be installed under practically any type of boiler, old or new. The motor, transmission, feed worm, retort, and fan assembly are mounted in front of and under the boiler. The retort and dead plates take the place of the regular grates.

The Iron Fireman is very easily installed, due to its compact assembly. Machines are shipped complete from the factory. All parts are standard and interchangeable.

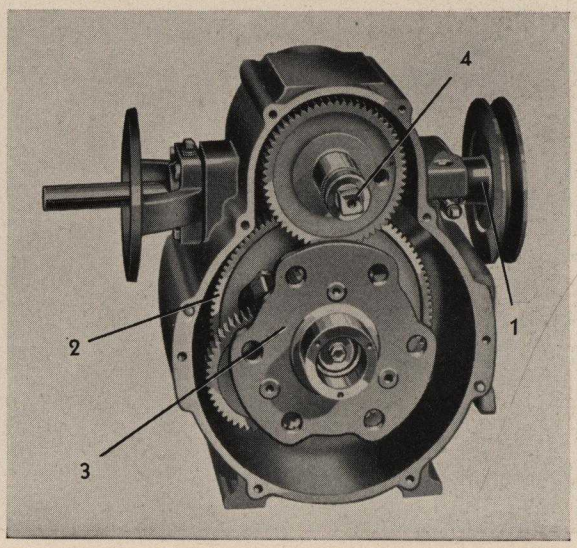
Where necessary, larger installation can be made in one day's time, or over a week-end, eliminating serious interruption of boiler service. Only a few hours are required to install the smaller units.

# *The* IRON FIRE

## *. . . the device that makes possible a non-agitated fire, enables in a slow, steady,*




Iron Fireman Continuous Feed Transmission is a sturdy, compact unit.




Front view, with cover removed. (1) Worm Gear Shaft, driven direct from motor. (2) Worm Gear. (3) Speed Change Assembly. (4) Jack Shaft.

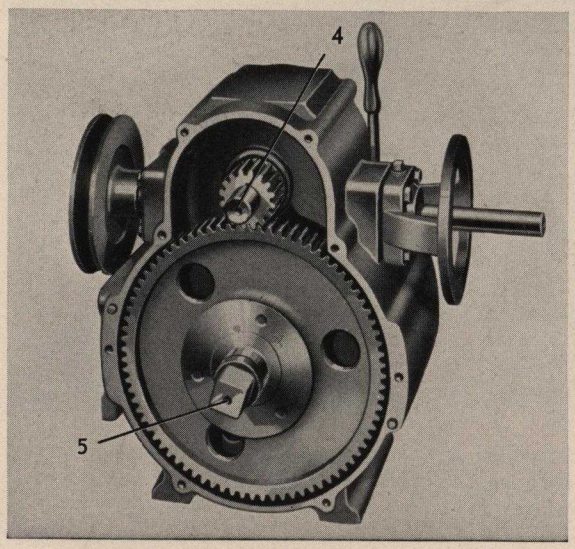
WITH THE DEVELOPMENT of its continuous feed transmission, Iron Fireman attains that significant achievement in coal firing —*a non-agitated fire*. Authorities agree that an efficient coal fire must have these essentials: First, *the fuel must be fed to the fire from below*. Second, *exactly the right amount of air must permeate the fuel, and* third, *the fire must be subjected to just as little agitation as possible*. This means that the fuel must be fed to the fire *continuously, not in spurts*. The volatile gases should be distilled off the green fuel at as low a temperature as possible and in the presence of an excess of oxygen. These gases on their passage to the stack should pass through an unbroken layer of incandescent fuel. *Iron Fireman has achieved these results*. Through the perfection of its compact, three-speed, continuous-feed transmission, Iron Fireman has achieved the final triumph, and makes a non-agitated fire a reality.

This continuous speed gear case does away with ratchets and plungers, which often agitate the incandescent fuel bed and release gases prematurely, *tending to make smoke instead of heat*. The Iron Fire-

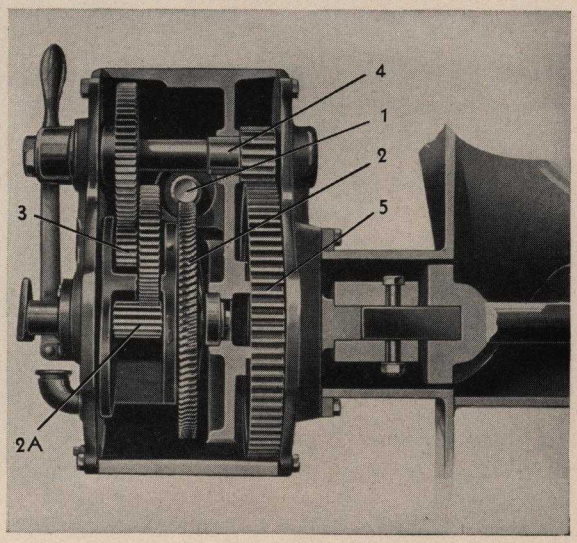
# MAN *Transmission*

## *Iron Fireman to feed coal exactly as the fire burns it . . .*

## *non-agitated stream*




Rear view, with cover removed. (4) Jack Shaft, (rear view), (5) Coal Feed Worm Drive Shaft.



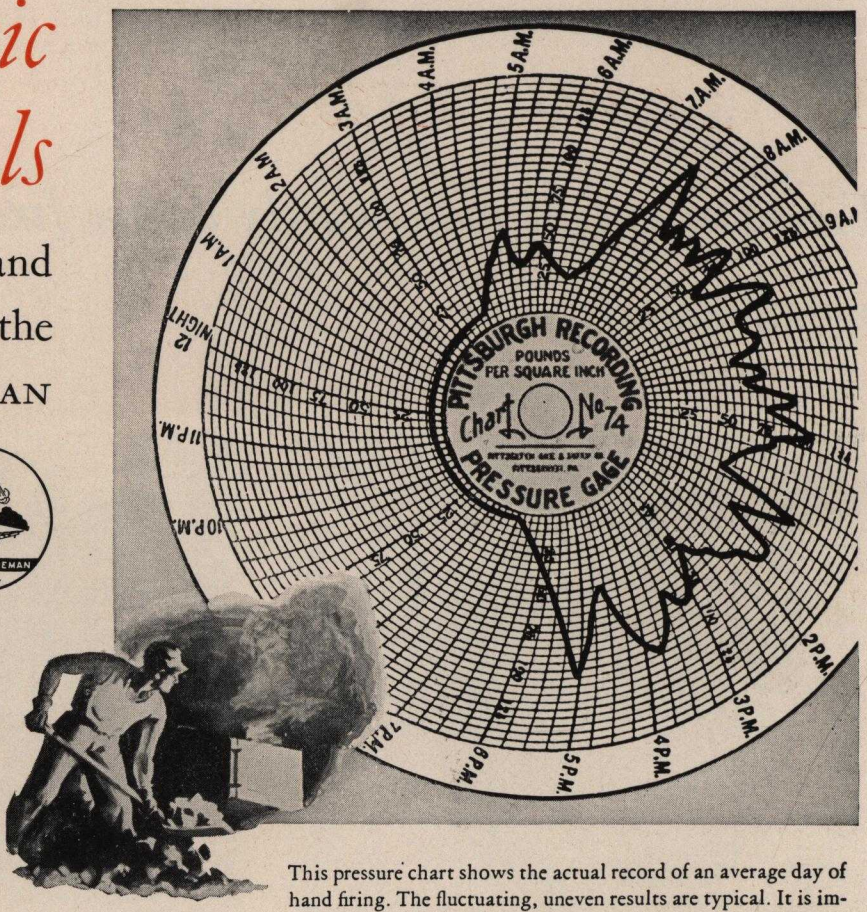

Left side sectional view. Showing how power flows from motor to main coal feed worm shaft. (1) Worm Gear Shaft. (2)Worm Gear. (2A) Pinion. (3) Low Speed Gear. (4) Jack Shaft. (5) Main Coal Feed Worm Drive Gear.

man transmission gives a well distributed fuel bed, assuring perfect combustion.

Iron Fireman *forced underfiring* now turns practically *all* the energy stored in the volatile gases into useful heat. Its delivery of fuel to the retort comes as near the theoretical and practical ideal as is scientifically possible. You are assured of *smokeless combustion!* You are assured that every atom of heat energy contained in the fuel is released for useful work in the boiler! The Iron Fireman transmission converts a motor speed of 1750 r.p.m. to a coal-feed-worm speed of 1/3 r.p.m. on low gear. There are three gear ratios, *each of which gives continuous feed*. This transmission is small and compact, and operates with a gear shift similar to an automobile. Its design is the result of many years of continuous research, study and experimentation in the Iron Fireman research laboratories and in the field. Iron Fireman maintains a large staff of research engineers operating in laboratories which are equipped with every facility for developing, testing and proving. The result is the outstanding leadership which Iron Fireman today occupies in the field.

# *Automatic Controls*

which start and stop the IRON FIREMAN



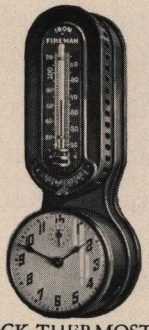

This pressure chart shows the actual record of an average day of hand firing. The fluctuating, uneven results are typical. It is impossible with hand firing to hold temperature or pressure steady.

HOT WATER CONTROL

This control automatically maintains any desired water temperature in hot water boilers.


PLAIN THERMOSTAT

The Iron Fireman plain Thermostat embodies all of the features of the Clock Thermostat, with the exception of the clock control.

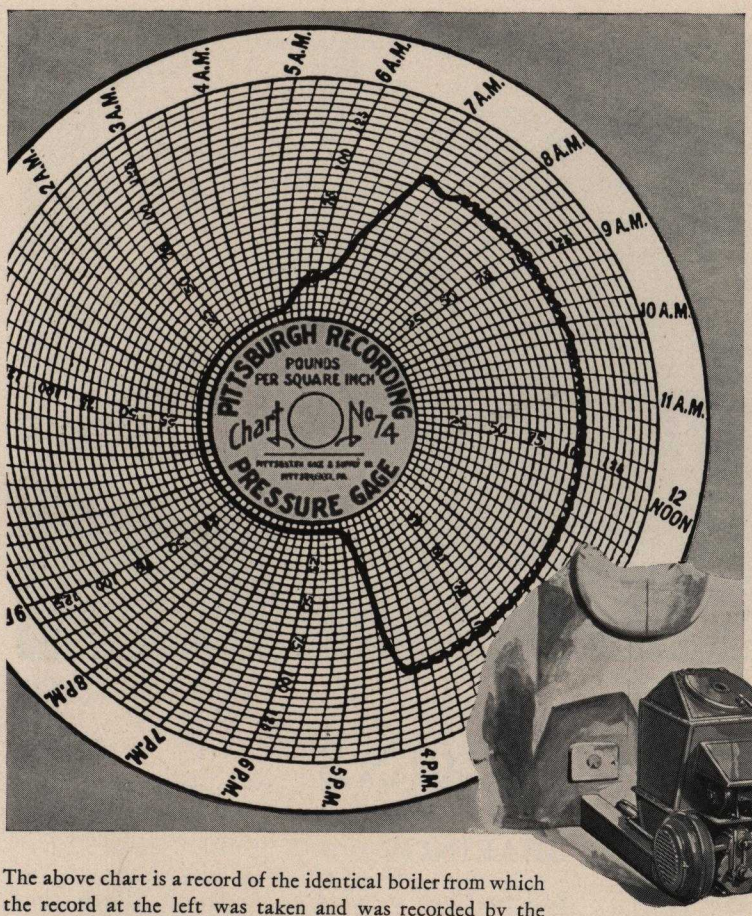


CLOCK THERMOSTAT

Supplied in two models—1-day and 8-day.


MOTOR DRIVEN RELAY SWITCH

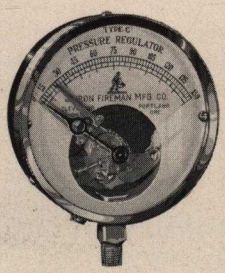
A positive, motor driven relay switch, operated by the controls shown on this page.




The above chart is a record of the identical boiler from which the record at the left was taken and was recorded by the same recording device *after an Iron Fireman* was installed.

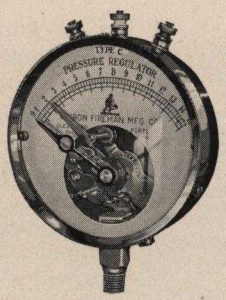
# *Results of Automatic Control*

The results of automatic firing are graphically shown by the reproductions of actual recording gauge records shown at the left. This improvement in regulation of pressure or building temperature alone justifies installing an Iron Fireman.



3-TERMINAL PRESSURE REGULATOR

This type of regulator is made for steam boilers of any pressure.

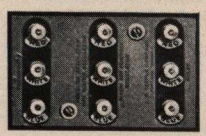


6-TERMINAL PRESSURE REGULATOR

This regulator is for use on low pressure steam boilers and vacuum systems. Can be used in connection with room thermostat, giving dual control without using terminal block.


FURNACE REGULATOR

This instrument prevents the furnace temperature from exceeding its point of greatest efficiency while room temperatures are rising.

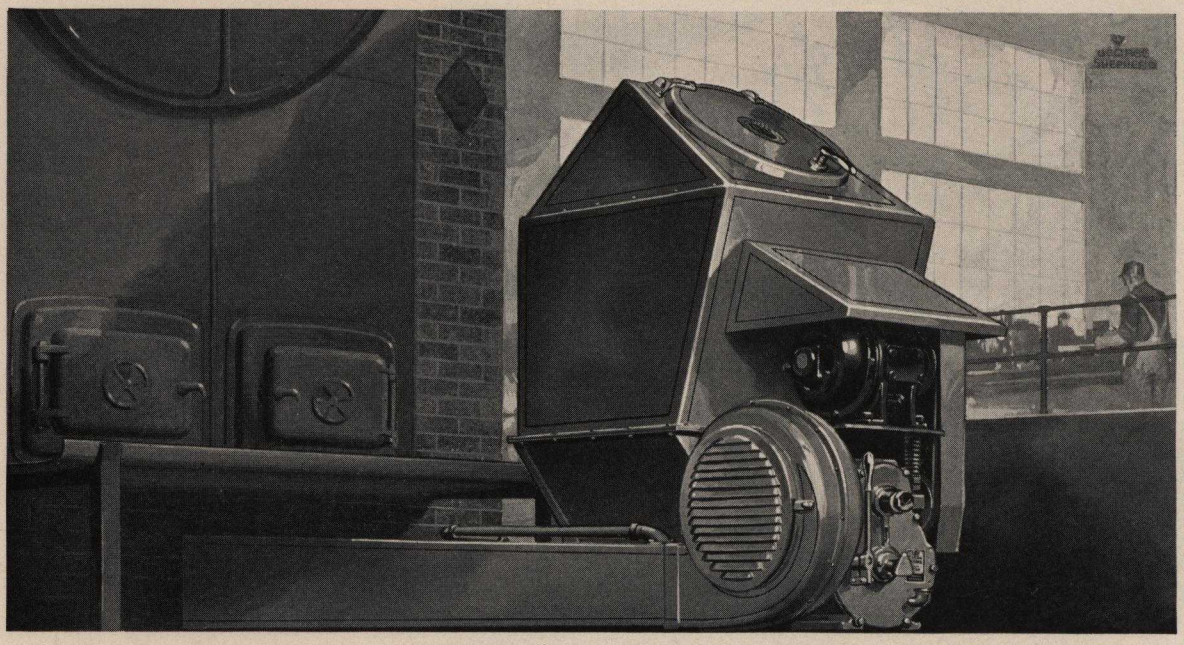


TERMINAL BLOCKS

For facilitating electrical connections when using dual control systems.

TIMETACTOR

Starts the Iron Fireman at predetermined intervals and keeps it running for a few minutes, in order to keep the fire alive during mild weather.



# SPECIFICATIONS

## MOTOR

Standard make, of any phase and voltage and for any frequency or current. Mounted on spring-supported and rubber-cushioned motor plate, and protected by steel motor cover.

## MOTOR CONNECTION

Power from motor transferred to gear case by V-belt drive, assuring quiet, flexible operation.

## TRANSMISSION

Three speed transmission (patented) designed to give continuous flow of fuel. Speeds may be shifted at any time, whether stoker is operating or idle.

## GEARS

*Worm Gear Shaft*—Special chromium alloy, double heat treated.

*Worm Gear*—High grade bearing bronze, fully machined in gear generator.

*Transmission Gears*—Drop forged from special alloy steel.

*All Other Gears*—Machined from solid bar steel.

All gears are double heat treated, tested for hardness and checked to micrometer measurements with snap gauges checked against Johannsen master gauges.

## BEARINGS

Ball bearings are used at points to which they are best adapted, and high grade bronze bushings are used at all other bearing points.

## TRANSMISSION CASE

Fine grained gray iron casting, sand blasted, machined in jigs to close tolerances, washed and treated inside with special enamel which seals the pores and eliminates free abrasive substances.

## LUBRICATION

All gears and shafts in transmission run in continuous bath of special transmission lubricant, provided by the factory.

## GEAR SHIFT

Positive bolt lock inside the housing, operated by the gear lever on the outside, locks the gears into mesh for the speed desired. To shift gears, simply pull out on gear lever handle, turn gear change dial to speed desired and let gear lever slip back into position. It is impossible to strip gears in shifting.

## SAFETY SHEAR PIN

A safety device which prevents breakdown in case a railroad spike or similar obstruction gets into coal. Can be quickly replaced.

## AIR PRESSURE FAN

Iron Fireman design and manufacture—centrifugal, parallel vane type. Quiet, powerful, compact and durable.

## AIR CONTROL

Iris damper on air intake regulates volume of air and amount of air pressure, except on the largest sizes, where a special damper in the air duct is employed.

## COAL FEED

Continuous worm feed from hopper to retort. Operates without agitating fire and without intermittent or jerking motions to cause undue strains.

## FEED WORM

Coal feed worm is special alloy steel casting fitted into steel tube housing. Manufactured under an exclusive process (patents pending), which insures precise dimensions and freedom from roughness or unequalities. The accuracy of this worm insures a smooth unimpeded flow of coal.

## RETORT

Iron Fireman design, the result of many years of scientific research. Consists of firepot and a series of tuyeres, containing air passages. Air coming through the tuyeres supplies oxygen for combustion, after the coal has been slowly preheated in the firepot. The retort is so designed that it gives proper coal distribution to the fire, which is most essential.

## AIR CHAMBER

In the smaller sizes, air chamber and retort are one unit. In larger sizes, air chamber is formed by dead plates supported by brickwork.

## HOPPER

Hopper is of heavy gauge, copper bearing, rust-resisting sheet steel. Hoppers are shaped to facilitate free flow of coal to the worm at the bottom. Closed dust and air tight hoppers are available on all excepting the three largest sizes.

## CONTROLS

Automatic thermostatic and pressure controls and relay switches permit regulated operation of any type of installation. Controls are specially designed and produced for Iron Fireman by the L. R. Teeple Company.

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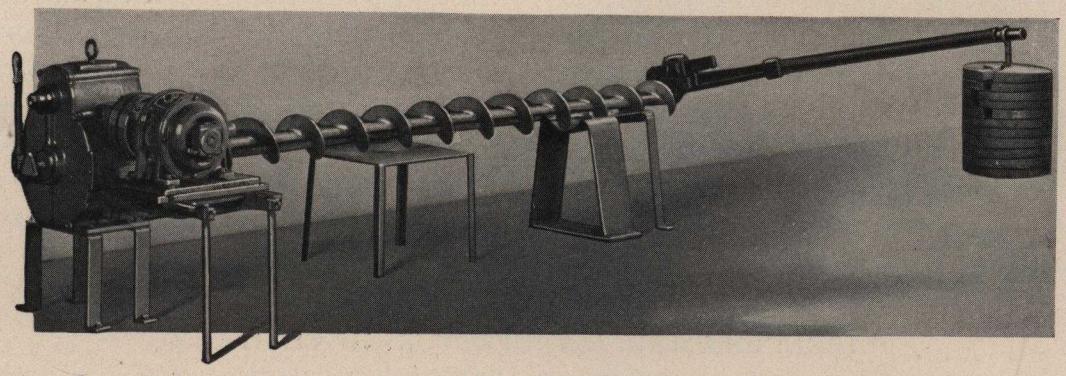
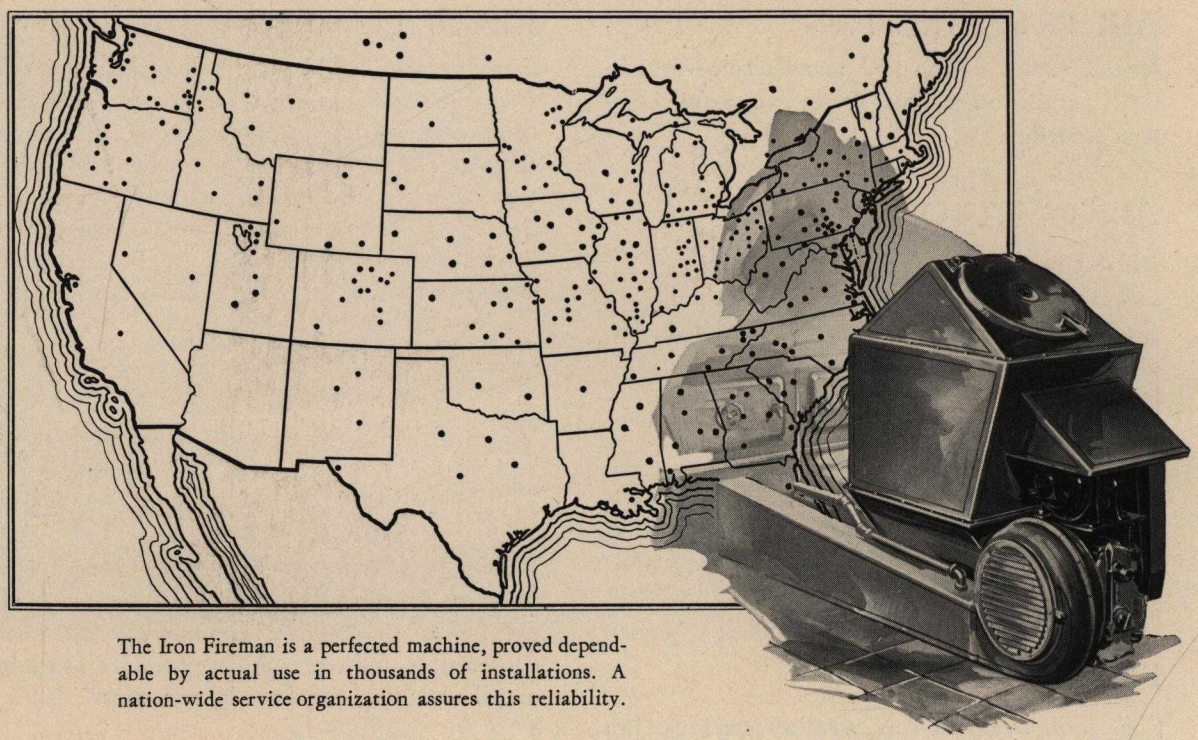
# Iron Fireman Feed Worms Undergo Rigid Torsion Test



Before an Iron Fireman feed worm leaves the factory it must pass exacting tests for strength and accuracy. In the torsion test illustrated above, a feed worm, driven by a standard transmission, is tested by means of a lever arm on the end of which are attached counter weights equal to twice the normal load to which the worm is subjected in actually feeding coal to the fire. After this test the worm is again checked. If for any reason it is not perfect, it is rejected. Iron Fireman feed worms are made of a special alloy steel which resists abrasion and corrosion. They are cast by a new process which gives them accurate spiral form, free from roughness or defects. Patents on this process are pending.



The Iron Fireman is a perfected machine, proved dependable by actual use in thousands of installations. A nation-wide service organization assures this reliability.

# IRON FIREMAN *dealers and engineers are a nation-wide organization*

THE IRON FIREMAN engineering and dealer organization is nation-wide. These trained men—backed by the largest manufacturing organization in the field—are at your service. They can help you with practical heating information gained through experience in serving thousands of boiler rooms and home heating plants in all parts of the country. Their object is to help you obtain better heating at lower costs, increased comfort and efficiency.

The Iron Fireman engineer in your community will make a survey of your heating or power plant or your home furnace, and render a report showing you present costs and results compared with the results and costs you may expect with an Iron Fireman. Such a check-up of your plant is sure to bring out facts you should know, and to result in savings or improved service. The Iron Fireman is recommended only after our engineers have ascertained the results it will bring.

IRON FIREMAN MANUFACTURING COMPANY

PORTLAND, OREGON

*Branches:* CLEVELAND, CHICAGO, ST. LOUIS. *Subsidiaries:* NEW YORK, MILWAUKEE

DEALERS IN PRINCIPAL CITIES AND TOWNS OF THE UNITED STATES AND CANADA

*There is only one* IRON FIREMAN . . . . . *the machine that made coal an automatic fuel*